

**INTEGRATED ELECTROSTATIC INDUCTIVE COUPLING
FOR PLASMA PROCESSING**

Abstract of the Disclosure:

An integrated electrostatic inductively-coupled (i-ESIC) device is provided for plasma processing that may be used as a primary or secondary source for generating a plasma to prepare substrates for, and to process substrates by applying, dielectric and conductive coatings. The i-ESIC device is practical for processing advanced semiconductor devices and integrated circuits that require uniform and dense plasma.

The invention may be embodied in an apparatus that contains a substrate support, typically including an electrostatic chuck, that controls ion energy by capacitively coupling RF power to the plasma and generating voltage bias on the wafer relative to the plasma potential. An integrated inductive coupling element is provided at the perimeter of the substrate support that increases plasma density at the perimeter of the wafer, compensating for the radial loss of charged particles toward chamber walls, to produce uniform plasma density above the processed wafer. An annular slotted shield protects the inductive coupling element from the plasma and provides conditions for effective inductive coupling of RF power into the plasma, such as eliminating capacitive coupling from the element to the plasma and unwanted sputtering of the element. The i-ESIC device has a capacitive coupling zone in its center where wafers are placed and an inductive coupling zone at the perimeter of the wafer coupled to a matching network and RF generator. Both zones together with plasma create a resonant circuit.